



Relationship between parenting style and internet addiction: Interpersonal relationship problem as a mediator and gender as a moderator

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ABSTRACT

Purpose: This study assessed the moderating effect of gender on the indirect effects of positive and negative parenting styles on Internet addiction through interpersonal relationship problem.

Methods: A cross-sectional survey of randomly sampled 1194 college students recruited voluntarily from three universities in China was conducted to assess the variables of positive and negative parenting styles, interpersonal relationship problem, and Internet addiction.

Results: Positive parenting style, such as emotional warmth, was a protective factor for the development of Internet addiction, whereas negative parenting style, such as rejection and overprotection, was a potential risk factor for Internet addiction. Furthermore, interpersonal relationship problem completely mediated the association between positive parenting style and Internet addiction but partially mediated the relationship between negative parenting style and Internet addiction. Finally, gender moderated the indirect effect of parenting style on Internet addiction through interpersonal relationship problem.

Conclusion: The correlation between positive parenting style and interpersonal relationship problem was considerably weaker among females, whereas the association between interpersonal relationship problem and Internet addiction was much stronger among females. For the prevention and intervention of Internet addiction, it is important to increase positive parenting style for males while enhancing interpersonal skills training for females. Further longitudinal studies should discuss the effects of paternal and maternal parenting styles on Internet addiction.

1. Introduction

The prevalence of the Internet and smartphones suggests that they have become increasingly integrated into our daily lives, serving as an extensively used tool for personal communication, information acquisition, academic research, and entertainment [1]. Although the widespread adoption of the Internet significantly facilitates people's lives, concern is growing regarding the deleterious consequences of excessive Internet use. Excessive Internet use is preceded by or occurs concurrently with psychological distress, such as

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mental health symptoms [2]. However, there is no consensus on the terms that describe excessive, unhealthy, and addictive Internet use, which has been referred to as Internet addiction, pathological Internet use, Internet dependency, problematic Internet use, and excessive Internet use [3–5]. In this study, problematic excessive preoccupation with the Internet is termed Internet addiction, which is extensively used in China.

Understanding the factors that contribute to Internet addiction is crucial, one of which is the influence of parenting style. Parenting style is categorized based on the general patterns of parents' attitudes and emotional care toward their children [6]. There are four common parenting styles: authoritarian, indulgent, authoritative, and neglectful [7]. However, some researchers claimed that it is more important to study the perceptions of parenting than actual parenting behaviors to predict psychological outcomes [8]. Parenting style, measured by different version of the Egna Minnen av Barndoms Uppfostran, refers to the perceived parenting attitude and emotional care as well as parenting behaviors in parent-child interaction. It is classified into emotional warmth, rejection, and overprotection [9]. Research documented the influence of parenting style on life satisfaction and educational adjustment among university students [10]. Furthermore, parenting style is significantly correlated with Internet addiction among children, adolescents, teenagers, and college students [11–15]. Significant cultural differences have been found in parents' attitudes toward their children across countries. For instance, mediation strategies among parents differed in Turkey and Greece [16]. Nevertheless, the mechanisms underlying the association between parenting style and Internet addiction among Chinese college students have not yet been adequately studied.

Based on the cognitive-behavioral model, individuals with pre-existing psychological problems such as loneliness and interpersonal relationship problem are especially vulnerable to Internet addiction [17–20]. Hence, according to cognitive behavioral models, interpersonal relationship problem, can be considered a preexisting risk factor that accounts for the origin and pathogenesis of Internet addiction. To further explore this association, prior research demonstrated that loneliness mediates the relationship between interpersonal relationship problem and Internet addiction [20]. This means that college students with interpersonal relationship problem were more drawn to online communication and more likely to develop Internet addiction. It may be more attractive to individuals with difficulties in face-to-face interpersonal relationship to seek virtual social communication [21].

A meta-analysis suggested that gender had no effect on the relationship between parenting style and Internet addiction [13]. Conversely, gender-based differences have been extensively identified in parenting style, Internet use, and Internet addiction [22–24]. The incongruence of findings might be attributed to confounding variables or underlying mechanisms linking parenting style to Internet addiction. Furthermore, the findings suggest that quality of interpersonal relationships, such as those with peers and friends, moderates the link between parenting style and Internet addiction [25]. Notably, interpersonal relationship problem is closely related to Internet addiction [20].

To address this gap, this study aimed to elucidate the potential role of interpersonal relationship problem and gender in illuminating the pathways through which different parenting styles are linked to Internet addiction among college students. Although many studies showed that parenting style and interpersonal relationship problem are strong predictors of Internet addiction, it is intriguing to question whether Internet addiction is mediated by parenting style with respect to interpersonal relationship problem. It is worth considering whether the indirect effect of parenting style on Internet addiction through interpersonal relationship problem depends on gender. Thus, it can provide guidance to professional counselors and families to create gender-sensitive interventions for Internet addiction.

1.1. Parenting style and internet addiction

Attention was paid to the relationship between parenting style and Internet addiction. Thus, it is conceivable that parenting style plays an important role in Internet addiction [14,26]. This may provide an increased understanding of parental behaviors related to Internet addiction [27]. Previous research indicated that parenting style is associated with Internet addiction in children and adolescents [11,13]. Similarly, research suggested that parenting style is significantly correlated with Internet addiction among college students [12,14]. Previous studies documented that different parenting styles may result in different parenting experiences [28]. In particular, negative parenting style could erode one's ability to form interpersonal relationships, while positive parenting style could enhance the ability to form interpersonal relationships [25]. An early study found that positive parenting style is related to the gain of parenting resources, and negative parenting style is related to the depletion of parenting resources [29]. Positive parenting style, such as emotional warmth, had a significant negative relationship with Internet addiction, whereas negative parenting style, such as rejection and overprotection, had a significant positive relationship with Internet addiction [14,30]. Prior research examined the role of parenting style in Internet addiction among children and college students. Studies indicated that negative parenting style directly predicts Smartphone addiction [31]. However, the mechanisms underlying positive and negative parenting style and Internet addiction should be examined further. In line with previous studies, we propose the following hypothesis.

Hypothesis 1. Positive parenting style is negatively related to Internet addiction, whereas negative parenting style is positively related to Internet addiction.

1.2. Parenting style and interpersonal relationship problem

As the social environment continues to change and presents more uncertainty, parenting style affects many aspects of social development. Researchers found that parenting style such as an abusive parental attitude have a negative and significant impact on peer attachment [6]. Nevertheless parenting style such as emotional warmth could help develop social relationships and ultimately

maintain intimate relationships [6]. Similarly, parenting style and parent-child relationships impact interpersonal relationship problem, such as depending on others for support and validation and lack of effective coping skills [32,33]. Specifically, college students with secure parental attachment during childhood tended to form close friends and were more satisfied with their interpersonal relationships. Prior studies reported an association between perceived parenting style and interpersonal relationship problem [33]. However, the association between positive and negative parenting style and interpersonal relationship problem requires further examination. Therefore, [Hypothesis 2](#) is as follows:

Hypothesis 2. Positive parenting style is negatively related to interpersonal relationship problem, whereas negative parenting style is positively related to interpersonal relationship problem.

1.3. Interpersonal relationship problem and internet addiction

The nature of interpersonal relationship problem, an important measure of feeling socially connected, such as to friends and classmates [34], is a strong predictor of Internet addiction [20]. Previous studies documented that relationship maintenance is a crucial daily activity for university students, which increases their risk of addiction [35]. For instance, people with more interpersonal relationship problem in the real world may depend on the Internet for communication and entertainment [36]. Similarly, the greater the need to maintain online friendships, the greater the likelihood of becoming addicted to Facebook [35] or the Internet [37,38]. Prior studies found a significant difference in quality of interpersonal relationships between addicts and non-addicts [39]. Empirical studies reported that social support from teachers and friends make adolescents less prone to Internet addiction [11,40]. However, the association between interpersonal relationship problem and Internet addiction remains unclear. Consequently, we propose the following hypothesis:

Hypothesis 3. Interpersonal relationship problem is positively related to Internet addiction.

1.4. A moderated mediation model, interpersonal relationship problem as a mediator, gender as a moderator

Considerable evidence suggests that parenting style plays a significant role in the development of Internet addiction [13,14,26,27]. From the cognitive-behavioral model perspective, psychological distress is an antecedent of Internet addiction [16,40]. Gratification of social needs was the main driving force for social contact in the early stages, while subsequent compensation for the preference for online social interaction increased during the addiction process [41]. Specifically, individuals who perceive face-to-face interactions as threatening and are unsuccessful in social contact turn to virtual communication, increasing their risk of Internet addiction. Generally, parenting style is closely associated with negative relationships with others later in life and, in turn, impacts the development of Internet addiction [42]. More importantly, quality of interpersonal relationships moderated the relationship between parenting style and Internet addiction [25]. Parenting style is closely associated with Internet addiction. Nonetheless, the mechanisms underlying this association has not been adequately studied. Thus, we propose the following hypothesis:

Hypothesis 4. Fourthly, we hypothesized that interpersonal relationship problem could mediate the relationship between positive parenting style and Internet addiction, and negative parenting style and Internet addiction.

Gender differences have been identified in Internet use and addiction [22,23]. However, some studies suggested that there are no gender differences, as participants who showed signs of Internet addiction did not differ by gender [37]. Nevertheless, a large body of evidence demonstrates gender-based differences. Previous research extensively examined gender differences in the relationship between parenting style and Internet addiction [13,23]. A recent study indicated that male university students showed a significantly higher level of Internet addiction than females university students [23]. Nevertheless, males perceive their parent's parenting style to be permissive or neglectful when it comes to the Internet, whereas females perceive the same to be authoritarian or authoritative [24]. Research indicates that females show greater intimacy with their parents and that males show greater interpersonal relationship problem with peers [6]. Nonetheless, the existing research has not completely examined the role of gender and interpersonal relationship problem in the association between positive and negative parenting style and Internet addiction. Hence, the association between parenting style, interpersonal relationship problem, and Internet addiction might vary according to gender, indicating that

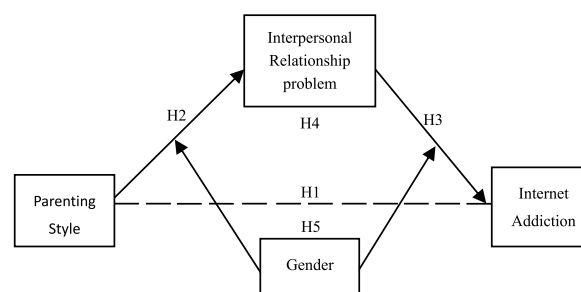


Fig. 1. Conceptual model for the association between parenting style, interpersonal relationship problem, gender, and Internet addiction. Conceptual moderated mediation model: interpersonal relationship problem as a mediator, gender as a moderator.

interventions should be geared toward the specific needs of males and females. Given these incongruent findings and the lack of understanding of the underlying mechanisms, this study aimed to address this gap by elucidating the potential role of interpersonal relationship problem and gender in the connection between parenting style and Internet addiction. Thus, we propose [Hypothesis 5](#). [Fig. 1](#) provides the conceptual diagram.

Hypothesis 5. Gender moderates the indirect effect of positive parenting style on Internet addiction through interpersonal relationship problem, and negative parenting style on Internet addiction through interpersonal relationship problem.

2. Methods

2.1. Participants

A total of 1288 college students (aged 17–24 years, $M = 19.94$, $SD = 1.23$) from three universities in western China were recruited using a random sampling method and volunteered to participate in the study. A total of 1194 valid questionnaires were collected, yielding an effective response rate of 92.70 %. The distribution of demographic information of the participants is as follows, family structure (only child 43.8 %, non-only child 56.20 %); gender (boys 62.14 %, girls 37.86 %), grade (freshman 59.80 %, sophomore 21.60 %, junior 12.40 %, senior 6.20 %), major (human science 20.44 %, science 31.07 %, engineering 34.34 %, athletics and arts 14.15 %), home place (village 51.00 %, town 12.40 %, county town 12.23 %, small urban 14.91 %, big city 9.46 %), paternal education (high school and below 66.75 %, diploma 14.16 %, bachelor 15.66 %, graduate and above 3.43 %), and maternal education (high school and below 70.60 %, diploma 13.23 %, bachelor 13.82 %, graduate and above 2.35 %).

Participants completed a self-report questionnaire that included items on parenting style, interpersonal relationship problem, and Internet addiction. The Chinese version of the Short-Form Egna Minnen av Barndoms Uppfostran, Diagnostic Scale of Interpersonal Relationship, and Revision of Chinese Internet Addiction Scale were administered to evaluate parenting style, interpersonal relationship problem and Internet addiction.

The study design was approved by the university's Ethics Review Board. Informed consent was obtained from all students to participate in the study, and the parents of minor participants (under 18 years) were also included in the study. All the participants were informed of their right to participate in the study. Respondents were invited to provide their demographic information voluntarily and anonymously. This study was conducted in accordance with the principles of the Declaration of Helsinki. The study design was approved by the appropriate ethics review board of the First Affiliated Hospital of the Air Force Military Medical University (KY20224106-1).

2.2. Measures

2.2.1. Parenting style

The abbreviated form of the Egna Minnen Beträffande Uppfostran (EMBU) was adapted from the original Swedish self-report measurement of memory during upbringing (81-item EMBU), which is equivalent to the EMBU for reliability. It is a widely used self-administered questionnaire to assess actual perceptions rather than early memories of parental rearing practices—perceived parenting style. The 21-item Chinese version of the s-EMBU was adapted and administered to parents and comprised rejection (six items: critical, punitive, and abusive parental attitudes), emotional warmth (seven items: parental behaviors of affection and support), and overprotection (eight items: anxious, intrusive, and overinvolved parenting patterns) subscales [9]. These subscales include items such as “My father/mother praises me” (Emotional warmth), “My father/mother punishes me for even the smallest mistakes” (Rejection), and “I feel my father/mother interferes in everything I do” (Overprotection). Parenting style that include “overprotection” and “rejection” was coded as negative parenting style, while parenting style that include “emotional warmth” was coded as positive parenting style. Items were rated on a four-point Likert-type scale ranging from 1 (never) to 4 (always). This instrument has been demonstrated to have satisfactory validity and reliability in the Chinese population [9]. Specifically, Cronbach's alpha was .921 for positive and .910 for negative parenting style. Cronbach's alpha was .866 for the overall scale.

2.2.2. Interpersonal relationship problem

The Diagnostic Scale of Interpersonal Relationship (DSIR) was used to diagnose interpersonal relationship problem along four dimensions. Sample items include “feeling nervous in social situations” (having conversations), “feeling unnatural meeting new people” (making friends), “excessive envy and jealousy of others” (getting along with others), and “don't know how to get along with the opposite sex” (relationship with heterosexual objects). This 28-item self-report instrument is rated from 0 (no) to 1 (yes), with high scores indicating a high level of interpersonal relationship problem [43]. It has been widely validated and shown to be reliable in Chinese culture [43]. The internal consistency coefficients obtained in this study were high, with an interclass correlation coefficient (ICC) of .862.

2.2.3. Internet addiction

The Revised Chinese Internet Addiction Scale (CIAS-R) [44], originally developed by Chen [45], is a self-administered screening tool that contains statements describing pathological or problematic Internet use among students. The scale has been confirmed to have good psychometric properties with indicators of reliability and validity for the Chinese version [44]. It comprises four independent subscales: Compulsive Use of the Internet and Withdrawal Symptoms of Internet Addiction (Sym-C, six items); Tolerance

Symptoms of Internet Addiction (Sym-T, four items); Interpersonal and Health-Related Problems of Internet Addiction (RP-IH, five items); Time Management Problems (RP-TM, four items). Sample items “Regardless of how tired I’m, I always feel very spirited when surfing the Internet” (Sym-C), “I find myself spending increasing time online” (Sym-T), “the Internet has had some negative effects on my studies or work” (RP-IH), and “I’ve been told more than once that I spend too much time online” (RP-TM). This 19-item scale ranges from strongly disagree (1) to strongly agree (4), with higher scores reflecting higher levels of Internet addiction. In this study, Cronbach’s alpha was .941 for the entire scale.

2.3. Statistical analysis

Descriptive statistics, correlations, and regression analyses were performed using SPSS version 22.0. Moderated mediation models were performed using the PROCESS macro recommended by Hayes [46]. Moderated mediation models were constructed using the PROCESS macro (Model 58) to test conditional indirect effects. All study variables were standardized prior to analyses for interpretability. A bias-corrected percentile bootstrap approach was used to test for indirect effects. Bootstrapping resampling for indirect effects was set to 5000. As the 95 % confidence interval does not overlap with zero, the result indicates statistical significance in conditional indirect effects or probing interactions.

3. Results

3.1. Common method variances

Common method variances were tested because all the data were based on self-reports. All study variables were tested for common method bias using Harman’s one-factor test [47]. The exploratory factor analysis found that there were 19 factors with eigenvalues greater than 1, and the first factor explained 10.29 % of the variance, indicating that common method bias is not an issue in this study.

3.2. Descriptive statistics

The demographic information of the participants, including age, family structure, gender, grade, major, home place, paternal education, and maternal education, and differences between groups for all variables are presented in Table 1. Grade differences were found in interpersonal relationship problem and Internet addiction. A major difference was found in terms of positive parenting style, negative parenting style and Internet addiction. Regarding positive parenting style and Internet addiction, significant differences were found in family structure, home place, paternal education, and maternal education.

As Fig. 2 shows, gender-based differences were found in positive parenting style, negative parenting style and interpersonal relationship problem. Specifically, males perceived weaker positive parenting style than females did, whereas males perceived stronger negative parenting style and interpersonal relationship problem. There were no gender differences in Internet addiction.

The Kaiser–Meyer–Olkin (KMO) value was 0.958 for Internet addiction, 0.907 for interpersonal relationship problem, 0.848 for parenting style, 0.841 for negative parenting style, and 0.829 for positive parenting style. This result indicated that a statistically acceptable factor solution represented the relationships between the study variables.

The correlations among all the study variables are presented in Table 2. Positive parenting style was inversely correlated with interpersonal relationship problem and Internet addiction, whereas negative parenting style had a positive relationship with

Table 1
Differences between males and females in study variables.

	Family structure		Gender		Grade	Major	Homeplace	Paternal Education	Maternal Education
	Only = 523		Male = 742		G1 = 714	M1 = 244	H1 = 609	PE1 = 797	ME1 = 843
	Non-only = 671		Female = 452		G2 = 258	M2 = 371	H2 = 148	PE2 = 169	ME2 = 158
					G3 = 148	M3 = 410	H3 = 146	PE3 = 187	ME3 = 165
					G4 = 74	M4 = 169	H4 = 178	PE4 = 41	ME4 = 28
							H5 = 113		
	t_i-t_j	t	t_i-t_j	t	F	F	F	F	F
Positive parenting style	.114	3.083**	-.211	-5.630***	1.161	12.619***	4.813***	6.961***	6.059**
Negative parenting style	.019	.712	.098	3.668***	.373	5.687***	.512	.999	.866
Interpersonal relationship problem	-.010	-.785	.073	5.844***	4.930**	2.997	1.474	.141	.247
Internet addiction	.090	2.336*	-.057	-1.449	23.448***	12.152***	5.884***	7.667***	8.184***

* $p < .05$, ** $p < .01$, *** $p < .001$.

Note: G1-G4 refer to freshman, sophomore, junior, and senior. M1-M4 refer to human science, science, engineering, and athletics and arts. H1-H5 refer to village, town, county town, small urban, and big city. PE1-PE4 refer to father’s education level: high school and below, diploma, bachelor, and graduate and above. ME1-ME4 refer to mother’s education level: high school and below, diploma, bachelor, and graduate and above.

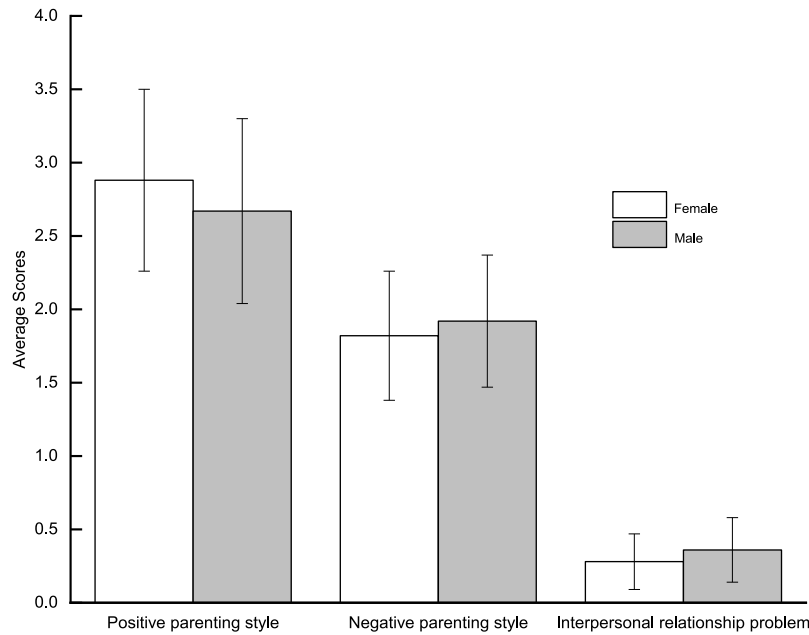


Fig. 2. Gender-based differences among positive parenting style, negative parenting style and interpersonal relationship problem. Compared to females, males perceived a weaker positive parenting style, a stronger negative parenting style, and Interpersonal relationship problem.

interpersonal relationship problem and Internet addiction. Additionally, interpersonal relationship problem was positively related to Internet addiction.

3.3. Mediating role of interpersonal relationship problem

Family structure, age, gender, grade, major, home place, paternal education, and maternal education were used as control variables. The mediation results indicated that, positive parenting style inversely predicts Internet addiction ($\beta = -.124, p < .001$) and interpersonal relationship problem ($\beta = -0.213, p < .001$). Interpersonal relationship problem positively predicts Internet addiction ($\beta = .348, p < .001$). Finally, the simple mediation model results revealed that positive parenting style had an indirect effect (Effect = -0.074 , LLCI = -0.100 , ULCI = -0.050) rather than a direct effect (Effect = -0.049 , LLCI = -0.102 , ULCI = 0.003) on Internet addiction through interpersonal relationship problem. Thus, interpersonal relationship problem fully mediated the association between positive parenting style and Internet addiction. Table 3 presents these results. Family structure, age, gender, grade, major, home place, paternal education, and maternal education were used as control variables. The mediation analyses indicated that negative parenting style had a positive impact on Internet addiction ($\beta = .250, p < .001$) and interpersonal relationship problem ($\beta = 0.275, p < .001$). Interpersonal relationship problem positively predicted Internet addiction ($\beta = .313, p < .001$). The bias-corrected percentile bootstrap approach indicated that the indirect effect of negative parenting style on Internet addiction through interpersonal relationship problem was significant, (Effect = $.086$, LLCI = 0.063 , ULCI = 0.111), whereas the direct effect of negative parenting style on Internet addiction was significant, (Effect = 0.164 , LLCI = 0.112 , ULCI = 0.216). Thus, interpersonal relationship problem partially mediated the association between negative parenting style and Internet addiction, with the mediation effect accounting for 34.40 % of the total effect.

Table 2
Descriptive statistics and correlations between study variables.

Variables	M	SD	1	2	3	4
1. Positive parenting style	2.749	.637	—			
2. Negative parenting style	1.881	.449	-.182***	—		
3. Interpersonal relationship problem	.328	.213	-.229***	.285***	—	
4. Internet addiction	1.951	.661	-.088**	.235***	.356***	—

* $p < .05$, ** $p < .01$, *** $p < .001$.

Table 3
Mediation effect of interpersonal relationship problem on the association between parenting style and Internet addiction.

Variables	β	SE	t	p
Positive parenting style → Interpersonal relationship problem	-.213	.029	-7.412	.000
Interpersonal relationship problem → Internet addiction	.348	.027	13.115	.000
Positive parenting style → Internet addiction	-.124	.028	-4.402	.000
Bootstrap	effect	SE	LL 95 % CI	UL 95 % CI
Bootstrap results for direct effect	.049	.027	-.102	.003
Bootstrap results for indirect effect	-.074	.013	-.100	-.050
Variables	β	SE	t	p
Negative parenting style → Interpersonal relationship problem	.275	.028	9.876	.000
Interpersonal relationship problem → Internet addiction	.313	.027	11.761	.000
Negative parenting style → Internet addiction	.250	.027	9.299	.000
Bootstrap	effect	SE	LL 95 % CI	UL 95 % CI
Bootstrap results for direct effect	.164	.027	.112	.216
Bootstrap results for indirect effect	.086	.012	.063	.111

* $p < .05$, ** $p < .01$, *** $p < .001$.

3.4. Moderating role of gender

It was hypothesized that interpersonal relationship problem mediates the relationship between parenting style and Internet addiction and that gender moderates the indirect effect on the association between parenting style and Internet addiction through interpersonal relationship problem. Family structure, age, grade, major, home place, paternal education, and maternal education were used as control variables. Moderated mediation models with respect to different parenting styles were constructed using the PROCESS macro (Model 58) to test conditional indirect effects.

As Table 4 illustrates, gender moderates the relationship between positive parenting style and interpersonal relationship problem ($a_3 = -0.135$, LLCI = -0.251 , ULCI = -0.018) and that between interpersonal relationship problem and Internet addiction, ($b_3 = -0.142$, LLCI = -0.252 , ULCI = -0.032). The direct effect of positive parenting style on Internet addiction was not significant, ($c' = -0.052$, LLCI = -0.104 , ULCI = 0.001), supporting a fully moderated mediation model. Specifically, gender positively moderated the first stage and negatively moderated the second stage of the conditional indirect effects of positive parenting style on Internet addiction.

As Table 5 shows, gender did not moderate the relationship between negative parenting style and interpersonal relationship problem ($a_3 = 0.052$, LLCI = -0.062 , ULCI = 0.167) but moderated the relationship between interpersonal relationship problem and Internet addiction, ($b_3 = -0.130$, LLCI = -0.239 , ULCI = -0.021). The direct effect of negative parenting style on Internet addiction was significant ($c' = 0.162$, LLCI = 0.111 , ULCI = 0.214), supporting the partially moderated mediation model. Specifically, gender moderated the second stage of the conditional indirect effects of negative parenting style on Internet addiction.

When the moderator was dichotomous, the index of moderated mediation was used to test the equality of the conditional indirect effects in the two groups. The results indicated an equal indirect effect of positive parenting style on Internet addiction through interpersonal relationship problem for males and females, with an index of -0.023 , $SE_{boot} = 0.027$, 95%CI = $(-0.074, 0.030)$. The results indicated that the indirect effect of negative parenting style on Internet addiction through interpersonal relationship problem was moderated by gender and equal for males and females, with the index of moderated mediation being -0.017 , $SE_{boot} = 0.025$, 95%CI = $(-0.068, 0.031)$.

Fig. 3 illustrates positive parenting style as a predictor of interpersonal relationship problem separately for males and females. A

Table 4
Regression results for the conditional indirect effect with regard to positive parenting style (moderated mediation).

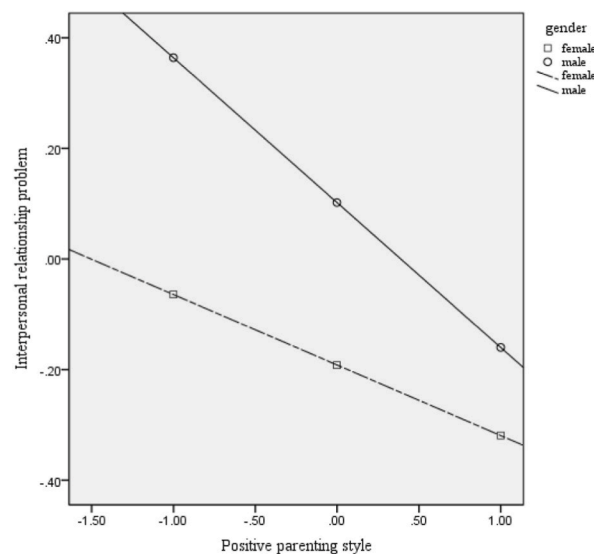
		interpersonal relationship problem (M)					Internet addiction (Y)			
		B	SE	LL 95 % CI	UL 95 % CI		B	SE	LL 95 % CI	UL 95 % CI
Positive parenting style (X)	$a_1 \rightarrow$	-.127	.048	-.221	-.034	$c' \rightarrow$	-.052	.027	-.104	.001
Interpersonal relationship problem (M)						$b_1 \rightarrow$	.446	.047	.354	.539
Gender (W)	$a_2 \rightarrow$	.294	.063	.171	.417	$b_2 \rightarrow$	-.251	.058	-.365	.137
$X \times W$	$a_3 \rightarrow$	-.135	.060	-.251	-.018					
$M \times W$						$b_3 \rightarrow$	-.142	.056	-.252	-.032
Constant	$i_M \rightarrow$	-.574	.587	-.578	1.727	$i_Y \rightarrow$	.808	.536	-.244	1.861
Grade		.098	.042	.017	.180		.294	.038	.220	.368
Major							-.061	.028	-.116	-.007
Age							-.058	.029	-.114	-.002
		$R^2 = .083$					$R^2 = .213$			
		$F(10, 1183) = 10.677^{***}, p < .001$					$F(11, 1182) = 29.124^{***}, p < .001$			
Conditional indirect effect at gender						effect	SE		LL 95 % CI	UL 95 % CI
female							-.057	.022	-.102	-.016
male							-.080	.016	-.112	-.050

* $p < .05$, ** $p < .01$, *** $p < .001$.

Table 5

Regression results for the conditional indirect effect with regard to negative parenting style (moderated mediation).

		interpersonal relationship problem (M)					Internet addiction (Y)			
		B	SE	LL 95 % CI	UL 95 % CI		B	SE	LL 95 % CI	UL 95 % CI
Negative parenting style (X)	$a_1 \rightarrow$	.241	.046	.151	.332	$c' \rightarrow$	.162	.026	.111	.214
Interpersonal relationship problem (M)						$b_1 \rightarrow$	.404	.047	.312	.496
Gender (W)	$a_2 \rightarrow$	.309	.061	.189	.429	$b_2 \rightarrow$	-.253	.057	-.364	-.142
$X \times W$	$a_3 \rightarrow$	.052	.058	-.062	.167					
$M \times W$						$b_3 \rightarrow$	-.130	.055	-.239	-.021
Constant	$i_M \rightarrow$	.775	.581	-.366	1.916	$i_Y \rightarrow$	.915	.529	-.123	1.953
Grade		.103	.041	.022	.183		.305	.037	.232	.379
Major							-.071	.027	-.124	-.018
Age							-.062	.028	-.117	-.007
		$R^2 = .110$					$R^2 = .235$			
		$F(10, 1183) = 14.627^{***}, p < .001$					$F(11, 1182) = 33.052^{***}, p < .001$			
Conditional indirect effect at gender						effect	SE	LL 95 % CI	UL 95 % CI	
female						.097	.021	.059	.141	
male						.080	.015	.053	.111	

* $p < .05$, ** $p < .01$, *** $p < .001$.**Fig. 3.** A visual depiction of the interaction between positive parenting style and gender on interpersonal relationship problem. Correlation between positive parenting style and interpersonal relationship problem was much weaker for female college students.

simple slope test indicated that for males, higher levels of positive parenting style were associated with lower levels of interpersonal relationship problem (simple slope = $-.262$, $t = -7.290$, $p < .001$). However, the correlation between positive parenting style and interpersonal relationship problem was much weaker among females (simple slope = $-.127$, $t = -2.678$, $p < .001$).

Interpersonal relationship problem predicted Internet addiction, separately for males and females, as depicted in Fig. 4. Simple slope tests indicated that the moderating role of gender in the association between interpersonal relationship problem and Internet addiction was stronger in females (simple slope = $.455$, $t = 9.672$, $p < .001$) than in males (simple slope = $.316$, $t = 10.198$, $p < .001$).

4. Discussion

This study investigated the relationships among parenting style, Internet addiction, interpersonal relationship problem, and gender. The findings suggested that positive parenting style, negative parenting style, and interpersonal relationship problem were strong predictors of Internet addiction. Moreover, the results generally supported the hypothesis that parenting style is associated with Internet addiction through the mediating effect of interpersonal relationship problem. Finally, our results indicate that the indirect effect of parenting style on Internet addiction through interpersonal relationship problem depends on gender. The findings shed light on possible mechanisms that can account for the associations between parenting style and Internet addiction, and have implications for intervention strategies for Internet addiction.

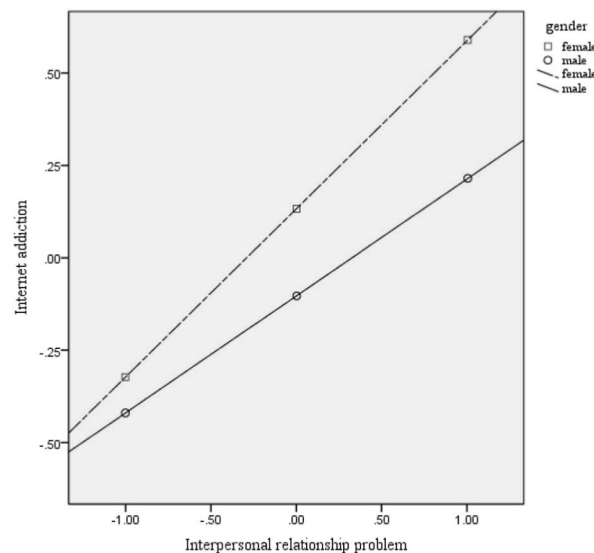


Fig. 4. A visual depiction of the interaction between interpersonal relationship problem and gender on Internet addiction. The moderated role of gender in the association between interpersonal relationship problem and Internet addiction was stronger for female college students.

4.1. Relationship between parenting style and internet addiction

This study showed that positive parenting style was inversely correlated with Internet addiction, whereas negative parenting style had a positive relationship with Internet addiction. Consistent with existing studies, this study showed that parenting style is a significant predictor of Internet addiction [12,14,26,30]. College students whose parents were overinvolved, showed rejection-type behaviors, or displayed insufficient emotional warmth were more likely to develop Internet addiction. Previous research also reported that problematic parenting styles such as strict attitudes and heavy punishment significantly predict Internet addiction [25]. In particular, positive parenting style, such as emotional warmth, had a beneficial effect on preventing Internet addiction, whereas negative parenting style, such as rejection and overprotection, was a potential risk factor predisposing individuals to Internet addiction. A Chinese family-based intervention program for Internet addiction has proven to be more effective than conventional group therapy [48]. Consistent with previous research, our study confirmed that parenting style plays a critical role in Internet addiction among college students.

4.2. Mediating role of interpersonal relationship problem

Previous research extensively investigated the importance of parenting style and interpersonal relationship problem in the development of Internet addiction and accompanying psychological and social problems [5,13,25,26,36]. Prior research suggested that parental positive supportive behavior is the best predictor of satisfactory peer relationships [6]. However, negative parenting style can lead to behavioral problems, including problems with Internet use [49]. Parental refusal, denial, and punishment negatively affect college students' interpersonal relationship problem.

Our results showed that interpersonal relationship problem mediated the association between parenting style and Internet addiction among college students. Further, interpersonal relationship problem fully mediated the association between positive parenting style and Internet addiction, while interpersonal relationship problem partially mediated the association between negative parenting style and Internet addiction. Previous studies suggested that poor or weak interpersonal relationships are closely linked to Internet addiction [37,38]. Notably, the Internet offers an alternative avenue for shy and lonely individuals to seek online communication and virtual socialization [17]. Moreover, online communication has become the preferred mode of communication for some individuals for several reasons, including feeling safer and more comfortable in the virtual world [50]. According to the cognitive-behavioral model, social isolation, low psychosocial well-being, alleviation of affective distress, and escaping psychological problems reinforce the need for online social contact, resulting in an increased preference for online social interactions [18,38,51]. The interpersonal relationship problem induced by the parenting style further prevented social interaction and made them turn to the Internet to fulfill their need for virtual social contact. Factors such as interpersonal relationship problem must be considered when developing strategies to prevent Internet addiction. Interpersonal skills training should be conducted to prevent Internet addiction among college students.

4.3. Moderating role of gender

This study revealed specific relationships between parenting style, interpersonal relationship problem and Internet addiction and provided insights into how these associations vary by gender. In our research, gender did not moderate the direct effect of parenting style on Internet addiction, but moderated the indirect effect of parenting style on Internet addiction mediated by interpersonal relationship problem. These results are consistent with the findings of a meta-analysis that revealed that gender did not moderate the relationship between positive and negative indicators of parenting style and Internet addiction [13].

Our results revealed that gender moderated the effect of parenting style on interpersonal relationship problem. This relationship was more significant among males than females. Compared to male college students, the effect of positive parenting style on interpersonal relationship problem was greater for female college students. There were no gender differences in the relationship between negative parenting style and interpersonal relationship problem. Negative parenting style is detrimental to all college students. This is probably partly due to the traditional and patriarchal societies of collectivist Chinese culture [52]. Traditional Chinese families, influenced by Confucian philosophy, believe that parents should be more severe on their sons so that they learn to take responsibility and pressure and prevent them from making mistakes, while daughters should be protected and cared for [52]. Another possible explanation is that parents are inconsistent in their attitude towards males; as the saying goes, “raising a son should be economically and raising a girl should be generously.” Since ancient times, males have borne more family pressures and carried more family expectations. Nonetheless, as contemporary women play an increasingly important role in society, they may face more pressure to balance their work and family. Previous research suggested that inconsistencies and contradictions between parenting styles are related to Internet addiction among males [53].

These results are consistent with the findings that psychological distress predicts a preference for online social interaction, leading to Internet addiction [51]. However, the association between interpersonal relationship problem and Internet addiction varies by gender. The moderating role of gender in the indirect effects of positive and negative parenting style on Internet addiction through interpersonal relationship problem was equal for females and males. Nevertheless, this study also identified the crucial role of interpersonal relationship problem in Internet addiction among females. For female college students, the effect of interpersonal relationship problem on Internet addiction was greater than that for male students. This may be primarily due to the diverse reasons for Internet use. Existing research demonstrated that female students mostly use the Internet to communicate and maintain social networks, whereas male students mostly use it for online gaming, information retrieval, and visiting adult sites [54]. These findings reveal that interventions to prevent Internet addiction should consider gender.

4.4. Practical implications

This study explored the factors influencing Internet addiction and examined the role of interpersonal relationship problem and gender in the association between parenting style and Internet addiction in the Chinese cultural context. Considerable attention has been paid to Internet addiction among college students, and useful suggestions for resolving this problem have been presented. Interventions should address the adverse effects of parenting style and interpersonal relationship problem on Internet addiction. The creation of gender-based interventions that meet the specific needs of males and females is promising. Moreover, college students should learn from interpersonal relationship training and attend relevant related mental health classes or activities. Families should also adopt an appropriate, positive, and supportive parenting style to support them. In particular, society has different requirements and standards for males and females. Gender-based differences in the relationships between parenting style, interpersonal relationship problem, and Internet addiction suggest that a multifaceted approach and different preventive strategies for Internet addiction should be provided for males and females. Therefore, it might be argued that to prevent and treat Internet addiction, increasing the positive aspects of parenting style is especially important for males, whereas interpersonal skills training is particularly important for females.

4.5. Limitations and future research

This study had several limitations. First, all the data were self-reported; thus, a cross-sectional analysis could not establish a cause-and-effect relationship among the variables. Second, paternal or maternal parenting styles are too ambiguous to describe. Longitudinal studies may be a better approach to explore evidence of causal relationships. However, parents may have different parenting styles, reflecting the “stern father and compassionate mother” in traditional Chinese culture. The mechanisms underlying paternal parenting style, maternal parenting style, Internet addiction, and gender differences in these variables should be further investigated. Third, although the measurement tools in this study were validated in Chinese college students, cultural differences should be studied further, and the potential for response bias should be considered. Future research should capture the various associations among the variables and constructs, compare multiple variables and interactions, and analyze the latent variables. Therefore, more objective measures should be developed to better assess interpersonal relationship problem and Internet addiction. Finally, although the study explored interpersonal relationship problem with friends, it did not address other phenomena or behaviors in interpersonal relationship problem. Future practical research should be conducted to investigate the causation between parenting style, mental health, and Internet addiction among college students.

5. Conclusion

This study expanded on previous research and examined the possibility that parenting style prevents Internet addiction among

college students and explored the effect of positive parenting style, such as emotional warmth, and negative parenting style, such as rejection and overprotection, on Internet addiction. Further, the results emphasize the important effects of parenting style on Internet addiction mediated by interpersonal relationship problem among college students. Notably, gender moderated the indirect effects of parenting style and Internet addiction through interpersonal relationship problem. More importantly, this study found that the relationship between positive parenting style and interpersonal relationship problem was stronger for males, whereas the association between interpersonal relationship problem and Internet addiction was stronger for females. A multifaceted approach and effective prevention strategies are essential when considering interventions to reduce Internet addiction, including changing parenting styles and improving social skills. In short, this study extends previous findings by showing that interpersonal relationship problem and gender are potential factors in preventing Internet addiction. These findings shed light on effective gender-based prevention strategies for the prevention and intervention of Internet addiction to increase positive parenting style and decrease interpersonal relationship problem among college students.

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Data availability statement

The data underlying this article cannot be shared publicly due to the privacy of individuals that participated in the study, but the data will be made available on reasonable request.

CRediT authorship contribution statement

Yanling Guo: Writing – review & editing, Writing - original draft, Investigation, Funding acquisition, Conceptualization. **HongYu Chen:** Investigation, Data curation. **Xuqun You:** Writing – review & editing, Supervision, Resources. **Xufeng Liu:** Writing – review & editing, Supervision. **Xiqing Sun:** Writing – review & editing, Supervision. **Yinchuan Jin:** Writing – review & editing, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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